Left pneumonectomy for complex aspergilloma after patent ductus arteriosus ligation

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Abstract

Surgery for complex pulmonary aspergilloma is known to be technically challenging, often for indurated hilar structures and obliterated pleural space. We report a case of left pneumonectomy for pulmonary aspergilloma with a history of patent ductus arteriosus ligation via anterolateral thoracotomy and aortopexy via median sternotomy and pericardiotomy. Left pneumonectomy was successfully accomplished by devising a surgical approach and procedures for transection of the left main pulmonary artery.

Keywords: Complex aspergilloma • Surgical intervention • Patent ductus arteriosus • Aortopexy • Pericardiotomy

INTRODUCTION

Surgery for complex aspergilloma is known to be technically challenging, owing to its high perioperative complication rates. Here we present a surgically challenging case of complex aspergilloma with previous surgical histories of patent ductus arteriosus (PDA) ligation and aortopexy.

CASE REPORT

A female patient, now 21 years old, underwent PDA ligation via anterolateral thoracotomy for PDA on the 27th day after birth and aortopexy, via median sternotomy and pericardiotomy for secondary tracheobronchial stenosis due to aortic compression, at the age of four. However, the left main bronchial stenosis remained, which caused secondary cystic bronchiectasis and recurrent pneumonia, leading to destruction and collapse of the lung and displacement of the heart. Left pneumonectomy was considered as a radical treatment for the non-functional, compromised left lung but, as the subjective symptoms were mild and recurrent pneumonia that could be managed by oral administration of antibiotics, surgery was not carried out.

The patient had haemoptysis for the first time at the age of 21 and was referred to our hospital for further evaluation. Her vital signs were normal. Chest examination and auscultation revealed decreased air entry and wheeze in her left chest. Aspergillus antigen was positive in her laboratory data. Her white blood count and C-reactive protein were 89 000/μl and 0.07 mg/dl. Chest computed tomography (CT) revealed a 3-cm fungus ball within the thickened apical cavity in the destroyed left lung (Fig. 1). The left lung was atrophic and the heart was rotated and dipped into the atrophic left pleural space, abutting the chest wall. Pulmonary vessels were running dorsally, beside the vertebral body. The left main bronchus was stenotic between the left pulmonary artery (PA) and descending thoracic aorta. A three-dimensional reconstruction image of the CT revealed a disruption of the left main bronchus, caused by compression of the displaced left main PA and descending aorta (Fig. 2).

Left pneumonectomy was performed via superior posterolateral thoracotomy, following left bronchial artery (BA) embolization. Thoracotomy was performed at the 4th intercostal space and the posterior chest wall—including the 2nd–4th ribs, which were densely adhered to the left lung—was concomitantly removed to obtain a wide surgical view within the atrophic pleural cavity locating dorsally. Main PA was unable to expose for the indurated tissues caused by the previous PDA ligation. Intrapericardial isolation of the PA was also thought to be dangerous due to the additional history of aortopexy. After clamping the vein, the left pulmonary veins (PV) was transected to ensure that lung congestion would not occur. The left main bronchus was transected as proximally as possible. By these steps, the lung could be mobilized dorsally, which allowed us to expose and divide the PA at the distal side of the PDA ligated area (Supplementary Video 1). The chest wall defect was not reconstructed. The operation time was 273 min. Total intraoperative blood loss was 660 ml and the patient required no blood transfusion. The postoperative course was uneventful and she was discharged 2 weeks after the operation. Pathological diagnosis was pulmonary aspergillosis. She has been followed up for 2 years and has returned to a normal life.

DISCUSSION

Aspergillus infection of the lung manifests as a wide spectrum of conditions. Complex aspergilloma, which manifests itself as a fungus ball with a severely thickened cavity and/or infections...
along the cavity, is also called ‘chronic necrotizing pulmonary aspergillosis’ [1]. It is categorized as moderately invasive disease between saprophytic colonization in the pre-existing cavity and invasive aspergillosis in immune-compromised patients. Although surgery has proved to be the best treatment for pulmonary aspergillosis, with the highest chance of achieving complete remission, techniques are difficult in patients with complex aspergillosis [1, 2]. Surgical outcome is reported to carry high morbidity and mortality rates due to various factors, such as severe intrathoracic adhesion, destruction of the lung, restricted thoracic space and hyper-vascularized arteries.

The difficulty of surgical procedure specific to our case of complex asperilloma was the limited approach to the PA, owing to two previous surgical histories. PDA ligation via antero-lateral thoracotomy produced indurated tissues around the stem of the main PA, and aortopexy via median sternotomy and pericardiotomy caused pericardial adhesion that became an obstacle to an alternative intra-pericardial approach. Therefore, under the circumstances of increased pulmonary arterial flow, caused by hyper-vascularized arteries, initial PV transection was the only approach for PA isolation.

The key point of our successful surgery was as follows. First, the strategic surgical approach was advantageous for this extraordinary anatomical structure. Approach to the target vessels and bronchus is the most important and necessary technique of anatomical lung resection. Because of the restricted pleural space caused by destruction of the left lung, superior postero-lateral thoracotomy was selected to afford an easy approach to the target vessels and bronchus. In addition, concomitant chest wall resection provided a better surgical field. This additional posterior chest wall resection—which resulted in minimal cosmetic problems, compared to antero-lateral chest wall resection—also contributed to reduced intraoperatively bleeding by interrupting extensive recruited chest wall collaterals, and to reduced post-operative pulmonary empyema by eliminating post-surgical thoracic space. Second, in terms of interrupting efferent thoracic artery branches into the pulmonary parenchyma, preoperative bronchial artery embolization and concomitant chest wall transplant.

**Figure 1.** (A) Chest CT showing a fungus ball at the apex of the left destroyed lung. (B and D) Dorsal deviation of left main pulmonary artery (black arrow head), superior pulmonary vein (white arrow head) and inferior pulmonary vein (black arrow) within a severely restricted pleural cavity, due to heart rotation. (C) Left main bronchus (white arrow) is severely stenotic, compressed between descending aorta and left pulmonary artery.

**Figure 2.** (A) Posterior view of the three-dimensional reconstructed CT image, showing a dorsal deviation of the left main PA (white arrow), severely narrowing the pathway of the left main bronchus. (B) Left main bronchus is disrupted (black arrow), compressed by left main PA and descending aorta.
resection contributed to reduced pulmonary circulation shunting from systemic circulation. By occluding such systemic arterial inflow, the left pulmonary perfusion pressure decreased, which contributed to preventing pulmonary congestion following earlier PV ligation.

CONCLUSION

A surgical history of PDA ligation and aortopexy was the obstacle to our surgical efforts and the main significance of our case was the strategy for approaching the PA under these difficult circumstances. Prior PV transection via superior posterolateral thoracotomy, concomitant with posterior chest wall resection and pre-operative bronchial arterial embolization, enabled transection of the PA, avoiding the previous PDA ligated area.

SUPPLEMENTARY MATERIAL

Supplementary material is available at ICVTS online.

Conflict of interest: none declared.

REFERENCES
